GPG FINDINGS

053

OCTOBER 2023

AUTOMATED BUILDING ENVELOPE SEALING

OPPORTUNITY

How much building energy use is attributed to air leakage?

4% **OF U.S. BUILDING ENERGY USE IS FROM AIR LEAKAGE** [1, 2]

TECHNOLOGY

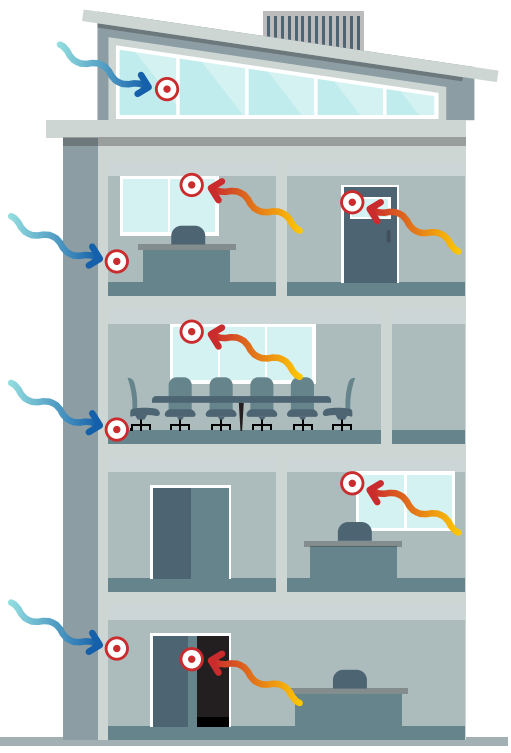
How does automated air sealing work?

SEALANT SELF-GUIDED TO LEAKS

Envelope is pressurized and then a non-toxic water-based sealant is aerosolized and drawn to leaks.

Performance can be customized, automatically seals leaks from 0.001–0.5 inch.

Eliminates human error and reaches inaccessible places.



M&V

Where did Measurement and Verification occur?

OAKRIDGE NATIONAL LABORATORY (ORNL) assessed the impact of automated air sealing, provided by Aeroseal, at the Denver Federal Center.

RESULTS

How did automated air sealing perform in M&V?

53% INCREASED AIRTIGHTNESS

From 0.23 CFM/ft^2 to 0.11; meets P-100 Tier 3 performance standards.[3] Manual sealing with spray foam/weather stripping typically reduces air leakage 6% to 17%.[4]

71% REDUCTION IN HVAC CAPACITY REQUIREMENTS

A tighter envelope enables the downsizing of Heating, Ventilation, and Air Conditioning (HVAC) equipment. In a leaky 200K ft^2 building, tightening the envelope can reduce the cost of an electric heat pump by $500K.[5]

1-DAY INSTALLATION

No issues post-installation. Can be applied to finished spaces but requires additional prep work, and is more expensive.[6] Since the evaluation was completed, costs have decreased to $0.90-$1/ft^2 for new construction and $1.75/ft^2 for finished space.

Savings are Site Specific

Greatest savings for leaky buildings in cold climates with more exposed surface area

Location		Leaky Baseline (1.2 CFM/ft^2)*		
CLIMATE ZONE	CITY	ELECTRICITY Savings kWH/ft^2/yr	GAS Savings kBtu/ft^2/yr	PAYBACK Years
2B	Phoenix, AZ	0.29	0.57	31
4B	Albuquerque, NM	0.07	5.37	21
4C	Seattle, WA	0.10	9.35	12
5A	Chicago, IL	0.79	19.27	5
6A	Minneapolis, MN	2.03	31.74	2

*Assuming an installed cost of $1.25 ft^2 for a 2-story, 210,887 ft^2 building and average GSA utility rates of $0.12/kWh for electricity and $9.6/MMBtu for gas.

DEPLOYMENT

Where does M&V recommend deploying automated air sealing?

SUPPORTS BUILDING ELECTRIFICATION

- Efficient electrification requires a tight building envelope.
- Applicable to historic buildings and may be particularly effective for brick, concrete, and limestone façades where other insulation methods are not possible.
- Specify in the design phase to reduce HVAC equipment and insulation costs.

[1]U.S. EIA. 2023. U.S. energy facts explained. Accessed 08-2023. [2]DOE EERE. 2014. Windows and Building Envelope Research and Development: Roadmap for Emerging Technologies. [3]Automated Air Sealing Demonstration, Denver Federal Center Building 40. Emishaw Iffa, Niraj Kunwar, Mikael Salonvaara (ORNL), August 2023, p.5 [4]D. Bohac, M. Hewett, J. Fitzgerald, J. Novacheck, and A. Lutz. 2014. "Leakage Reductions for Large Building Air Sealing." International Journal of Ventilation 12, No. 4 : 307–316 [5]Automated Air Sealing Demonstration, p.6 [6]Ibid, p.7